Abstract

Impedance spectroscopy is used to determine values associated with properties of a substance such as a fluid. In some embodiments, the present invention is applied to engine lubricants. A spectral matrix is constructed that comprises data taken from spectral plots. Also constructed is a result matrix comprising known quantities of a plurality of fluid constituents. A known analytic technique is performed on the spectral matrix to identify at least one principal component having significant influence on the spectral matrix. A reduced spectral matrix, wherein each column in the reduced spectral matrix is associated with a principal component having significant influence on the spectral matrix, is next created. A statistical technique uses the reduced spectral matrix and the result matrix to create at least one prediction equation. The prediction equation is used to predict at least one property in a second substance in situ.